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MC DONNELL AIRCRAFT CORP., ST. LOUIS, MO. (REPORT NO. 2382)

RAM JET HELICOPTER DEVELOPMENT - PROGRESS REPORT 62 -
MONTH OF OCT 1951

WOOD, C.R., JR. 15 NOV 51 13PP PHOTOS, DIAGRS.

USAF CONTR. NO. AF-33(038)-9845

HELICOPTER ROTORS, JET
HELICOPTERS - PERFORMANCE
ENGINES, RAMJET -
PERFORMANCE
H-20

ROTATING WING
AIRCRAFT (34)
DRIVE SYSTEM (6)

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Aircraft Corporation

ST. LOUIS • • • MISSOURI

REPORT NO. 2482 10 NOVEMBER 1951

PER CROSS REPORT 62
MONTH OF OCTOBER 1951
FOR JET HELICOPTER DEVELOPMENT

Contract AF33(036)-9645 Serial 3

REPORT _____ 2382

DATE _____ 15 November 1951

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PROGRESS REPORT 62

MONTH OF OCTOBER 1951

RAM JET HELICOPTER DEVELOPMENT

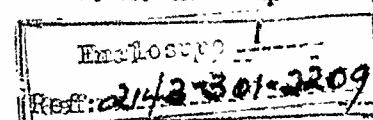
SUBMITTED UNDER Contract AF 33(038)-9845

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PAGE 1

REPORT 2382

MODEL XH-20

C O N T E N T S

	<u>Page</u>
1. SUMMARY	2
2. ROTOR DEVELOPMENT	
2.1 No. 1, 27-Foot Diameter Rotor Blade	3
2.2 No. 2, 27-Foot Diameter Rotor	4
3. RAM JETS	
3.1 Overspeed Failure	5
3.2 Modified Whirl Stand	5
3.3 Free Air Jet Test Stand	5
4. XH-20, USAF 46-689 and 46-690	
4.1 XH-20, No. 1, USAF 46-689	6
4.2 Modified XH-20, No. 2, USAF 46-690	6 & 7
5. DAILY FLIGHT SHEETS - XH-20 Helicopter Test Data	8
6. WORK PROGRAM FOR THE MONTH OF NOVEMBER 1951	8
7. FIGURES (1) THROUGH (5)	9 - 13

DATE 15 November 1951**MCDONNELL** *Aircraft Corporation*
ST. LOUIS 3, MISSOURIPAGE 4

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REPORT 2382

REVISED _____

MODEL XH-202.2 No. 2, 27-Foot Diameter Rotor

The design of the No. 2, 27-foot diameter rotor has been completed. MAC Drawing J1-2222 for the 27-foot rotor blade assembly is submitted herewith, Figure (5). WADC's approval is requested.

DATE 15 November 1951

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ST. LOUIS 3, MISSOURI

PAGE 5REPORT 2382MODEL XH-20

3. RAM JETS

3.1 Overspeed Failure

3.1 The modified radial finger type ram jets were repaired; the cracked areas were patched and the flame holder modernized. Figure (3) shows the deformed ram jet No. 33. Modified ram jet No. 32 failed in the over-speed tests of the No. 1, 27-foot rotor. Modified No. 33 was deformed and will not be utilized for subsequent work; see Figures (1) and (2).

3.2 Modified Whirl Stand

The modified whirl stand installation was continued during October. The whirl test stand is scheduled for completion during November 1951. Figure (4) is a drawing of the jet rotor whirl stand.

3.3 Free Air Jet Test Stand

The free air jet test stand was utilized for development of the 8.71-inch diameter ram jets during October. The flame holder design and position was established. A further test program is being directed towards improvement of the design of the fuel injector to ascertain the range of quiet burning. Tests for fuel injector improvement have indicated satisfactory controls of fuel flow and thrust. No trouble is expected in balancing fuel flow on the 27-foot rotor either on the whirl stand or on the helicopter.

DATE 15 November 1951

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MCDONNELL *Aircraft Corporation*
ST. LOUIS 3, MISSOURI

PAGE 6REPORT 2382MODEL XH-20

4. XH-20, USAF 46-689 and 46-690

4.1 XH-20, No. 1, USAF 46-689

The XH-20, No. 1, was exhibited at WADC on 5 and 6 October 1951. It is scheduled to be returned in November.

4.2 Modified XH-20, No. 2, USAF 46-690

The XH-20, No. 2, is standing by for installation of the No. 1, 27-foot diameter rotor blade assembly fitted with new 8.71-inch diameter ram jets, now under construction. This helicopter is to be utilized for the following flight test program which will be submitted for WADC approval in November:

4.2.1 CONTROL FORCE EVALUATION

4.2.1.1 Ground Test at the following conditions:

- (a) Three Rates of Movement: .1 Radian/Sec,
.5 Radian/Sec, and
1.0 Radian/Sec
- (b) 1,000 lbs. Rotor Thrust) 566 RPM - 3.5° Pitch
- (c) 800 ft./sec. Tip Speed)
- (d) Record the following:
 - Longitudinal Stick Force
 - Lateral Stick Force
 - Longitudinal Stick Position
 - Lateral Stick Position
 - Rotor RPM

4.2.2 PERFORMANCE

4.2.2.1 Hovering

- (a) Maximum hovering ceiling out of ground effect by determination of power required to hover with rotor one diameter above ground.

DATE 15 November 1951**McDONNELL** *Aircraft Corporation*PAGE 7

REVISED _____

ST. LOUIS 3, MISSOURI

REPORT 2382

REVISED _____

MODEL XH-20

4.2.2 PERFORMANCE - continued

4.2.2.1 Hovering - continued

(b) Record Blade Stresses as follows:

- (1) Steady flapwise bending approximately at Stations 1.75, 30, 82 and 126. At 566 RPM (800 F/S) and 495 RPM (700 F/S)
- (2) Steady torsion at pitch link at 566 RPM (800 F/S)

4.2.2.2 Forward Flight

- (a) Determine V Max as Limited by power, vibration, stresses or control limitation.
- (b) Record Blade Stresses at V Max and $\frac{1}{2}$ V Max as follows:

- (1) Steady and oscillating spanwise blade flapping moment at Station 1.75, 30, 82 and 126
- (2) Steady and oscillating blade chordwise bending moment at Station 1.75.
- (3) Steady and oscillating blade pitching moments.

4.2.2.3 Autorotation

- (a) Determine blade stresses during steady rates of descent and flare outs as follows:
 - (1) Steady and oscillating spanwise blade flap bending moment at Station 1.75, 30, 82 and 126.
 - (2) Steady and oscillating blade chordwise bending moment at Station 1.75
 - (3) Steady and oscillating pitching moments
- (b) Determine minimum rate of descent and general control characteristics.

4.2.3 RAM JET PERFORMANCE

- ###### 4.2.3.1 Throttling characteristics during quick stops, minimum power glides, etc.

- ###### 4.2.3.2 Determine altitude performance within safety limits.

DATE 15 November 1951**McDONNELL** *Aircraft Corporation*
ST. LOUIS 3, MISSOURIPAGE 8

REVISED _____

REPORT 2382

REVISED _____

MODEL XH-20

5. DAILY FLIGHT SHEETS - XH-20 Helicopter Test Data

There were no operations scheduled for the XH-20 during October.

6. WORK PROGRAM FOR THE MONTH OF NOVEMBER 1951

Construction of the new set of 8.71-inch diameter ram jets will be expedited during November for scheduled completion in late November or early in December. The design of the No. 2, 27-foot diameter rotor will be submitted for WADC approval in November.

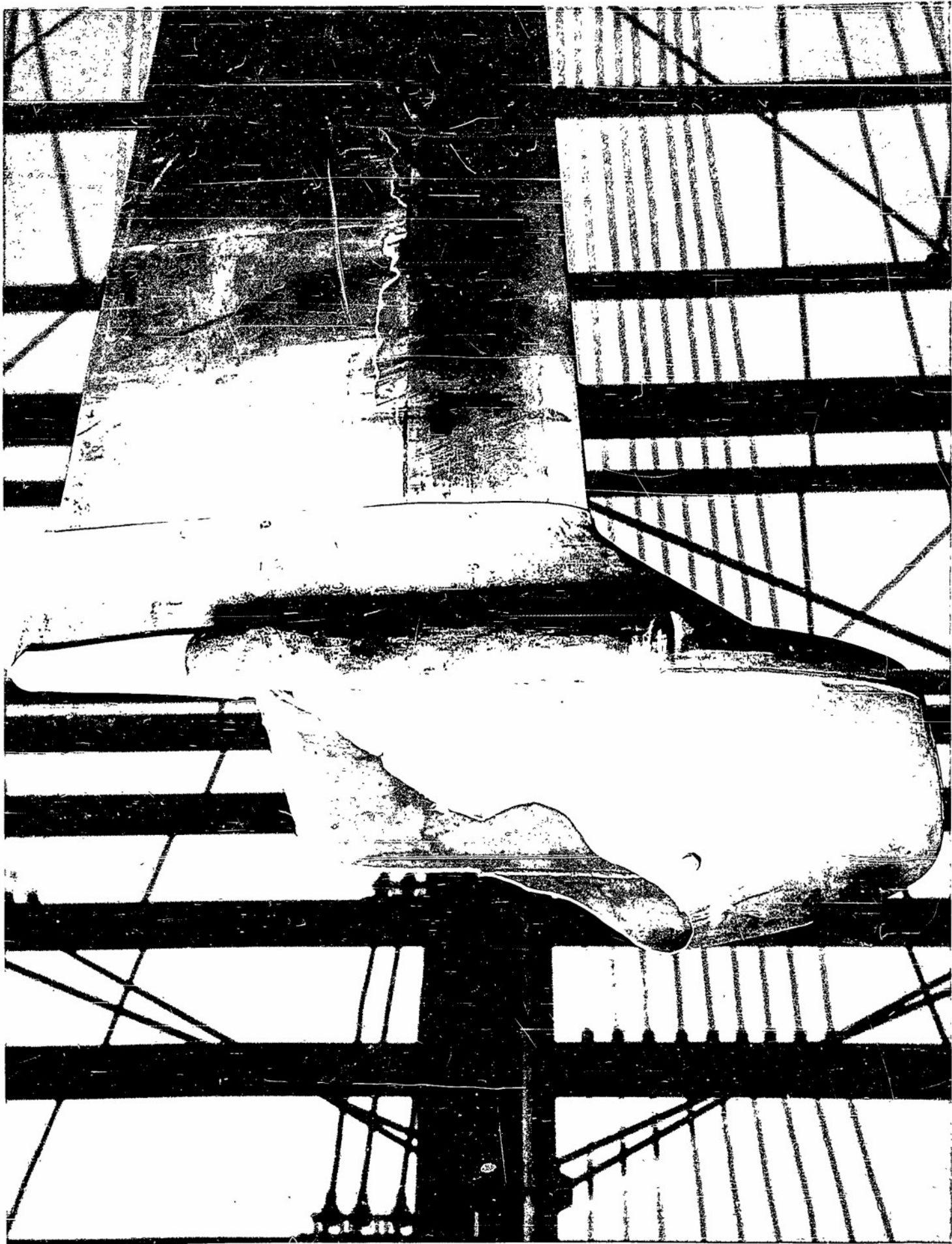
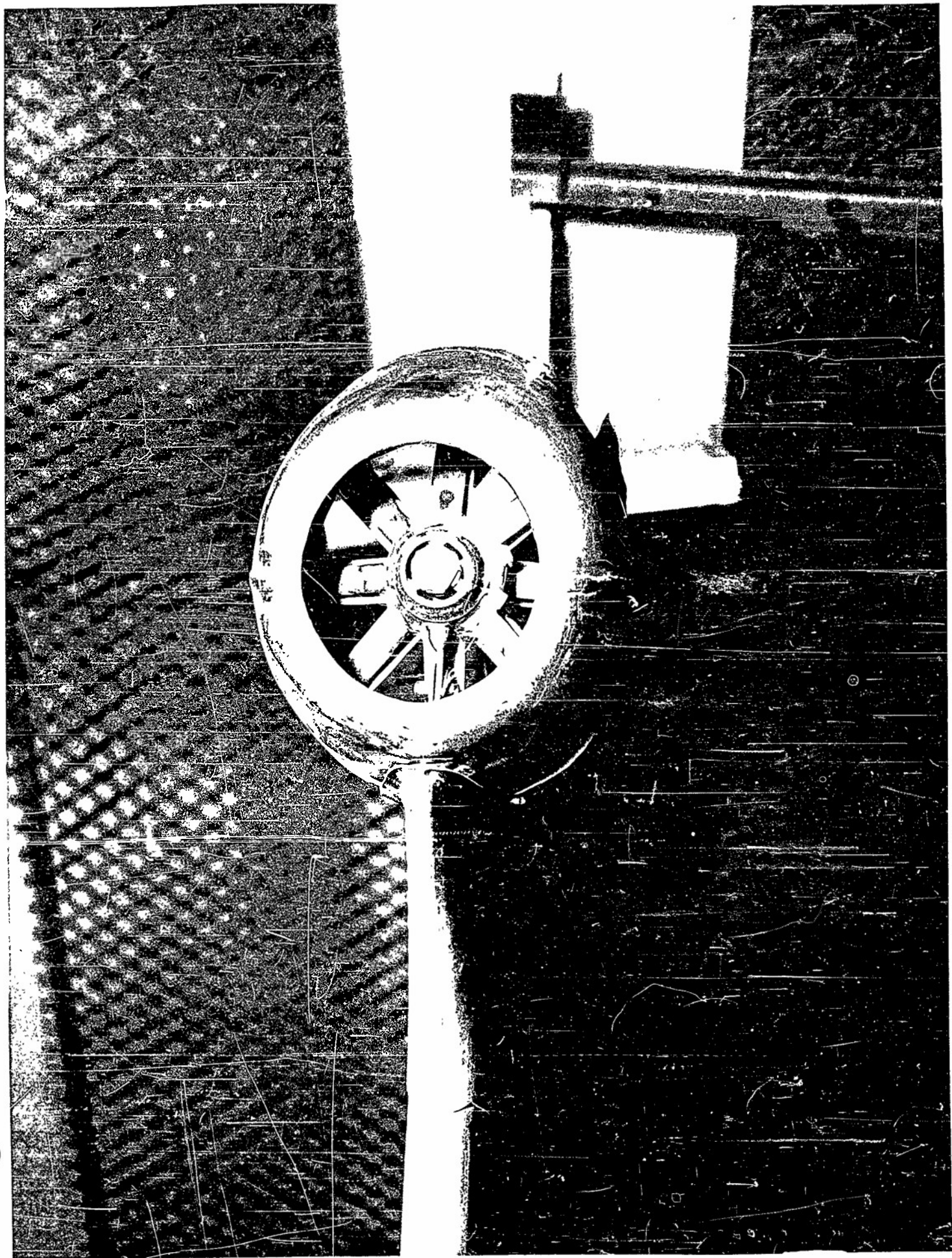
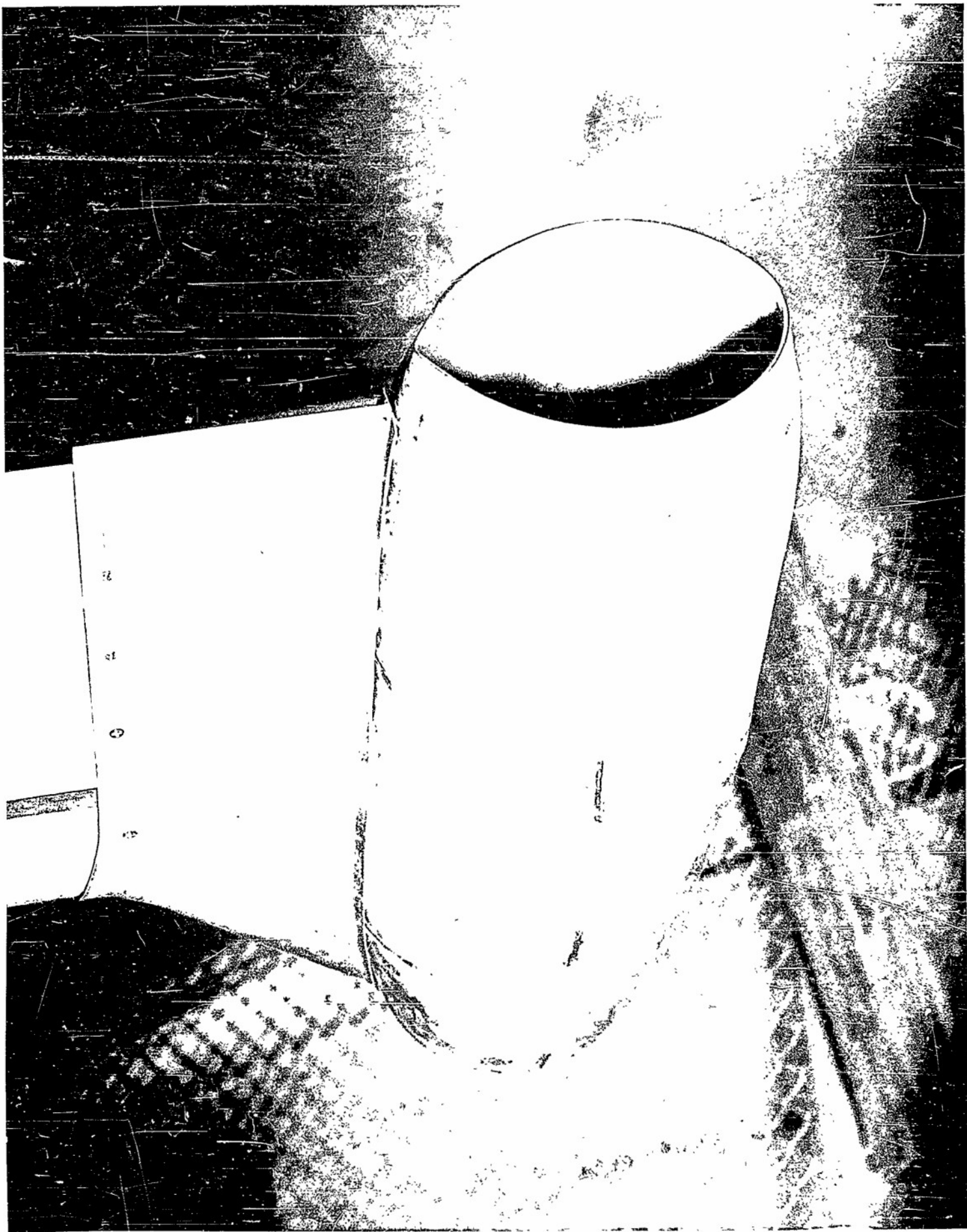


FIGURE (1) MAC NEG. D4E 26177 Ram Jet Failure

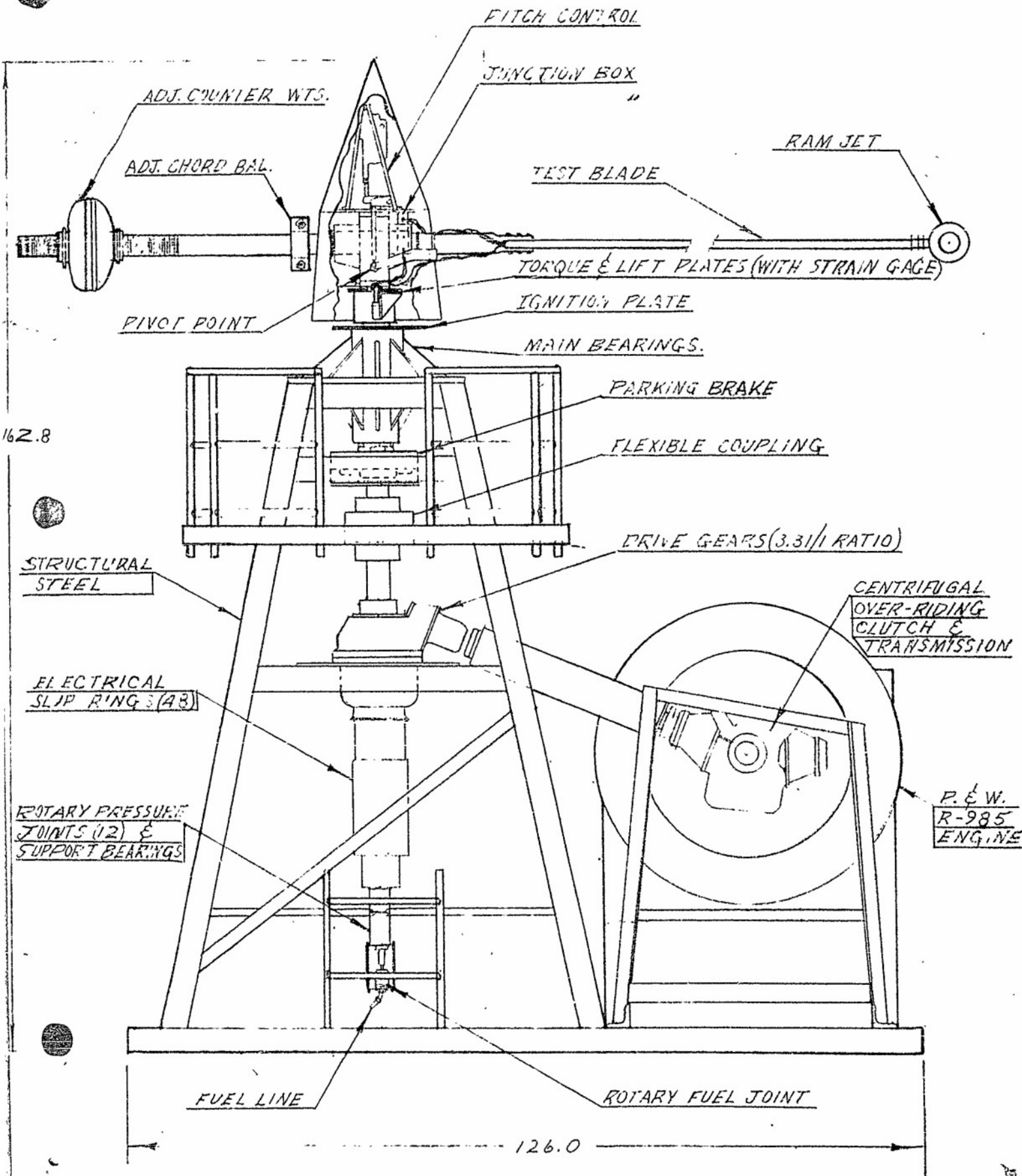




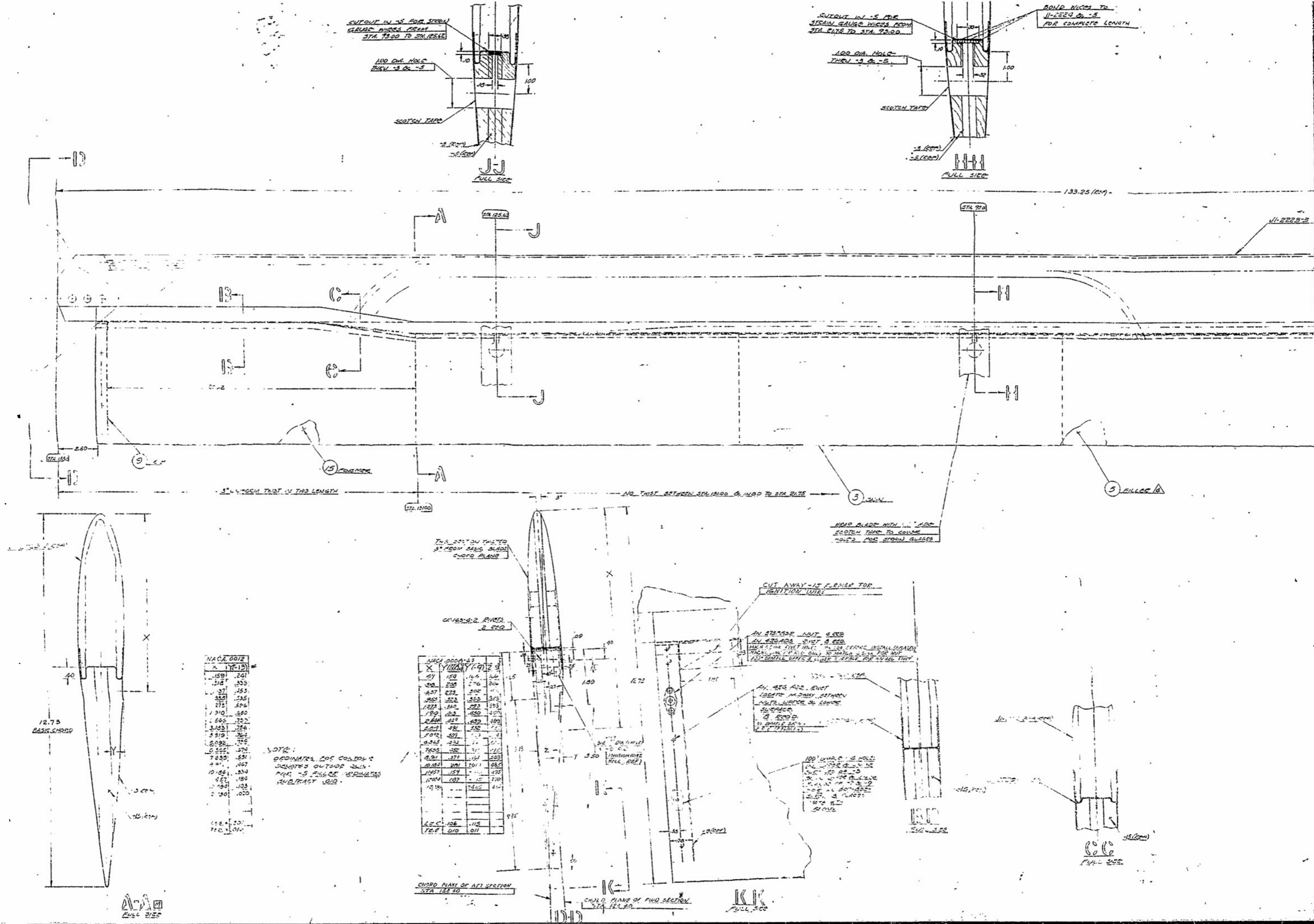
JET ROTOR WHIRL STAND

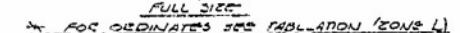
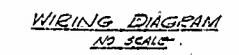
Page 12
Report 2382
Model XH-20

Figure (4)



JRL-358 (SEE JRL-353 FOR ASSEMBLY. SEE JRL-349 FOR "79" BLADE INST.)





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